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must be pronounced unfortunate, since they can only be regarded as metaphorical extensions of the same idea, obvious enough, but withal considerably strained.

For example, since *abstract* and *concrete* are synonymous respectively with *centre of isolation* and *superpositum*, and forasmuch as a natural law is an *abstractum*, centre of isolation, or *isolatum*, therefore we can never logically expect that there should exist a law comprehending and explaining the *entirety* of nature, for the reason that nature is a concretum or, *novo termino*, a superpositum—where-with a dangerous but popular metaphysical error is refuted.

The conclusion is undeniable. Yet it might be just as well to risk the chances of being misunderstood by merely saying that a thing which is a knowledge of a *part* cannot logically be a knowledge of a *whole* consisting of dissimilar parts. As an instance of the power of the new view the example is not felicitous.

There is no gainsaying but Professor Volkmann by long dwelling upon his ideas of isolation and superposition—through the associations naturally formed—has found them of inestimable value in his personal efforts at orientation; but we opine that their natural sphere of usefulness ceases at this point. In denying to them absolute validity, we must bear in mind his prefatory disavowal of such a qualification for all epistemological norms, and his position that we are in search here of advantageous points of view only. But have they a wide validity even as such? Are they not an encumberment of our epistemological machinery, which is pretty heavy as it is? A supererogation? In our judgment they merely elaborate the fact that the processes of analysis and synthesis have always been, and are still, widely used in thinking.

We have no occasion to remark upon Professor Volkmann's strictures of Monism, as he identifies its doctrine absolutely with the principles advanced by Haeckel; their falling wide of the mark here is not our concern. Nor are our own animadversions to be conceived as derogatory to the general merits of Professor Volkmann's book,—merits which we believe are solid and which we have sufficiently emphasised above.

T. J. McC.

GRUNDRISS EINER GESCHICHTE DER NATURWISSENSCHAFTEN, ZUGLEICH EINE EINFÜHRUNG IN DAS STUDIUM DER NATURWISSENSCHAFTLICHEN LITTERATUR. Von Dr. Friedrich Dannemann. I. Band: erläuterte Abschnitte aus den Werken hervorragender Naturforscher. Mit 44 Abbildungen in Wiedergabe nach den Originalwerken. Leipsic: Wilhelm Engelmann. 1896. Pages, 375. Price, M. 6.

The closing years of the nineteenth century have been pre-eminently years of reflexion and retrospect. In the fever and haste of acquisition which followed upon the astounding revelations of the two first and classical centuries of scientific inquiry, ours had little time or composure for reverting to the works of the masters either for criticism or for stimulus. For the first the need did not as yet exist, and as for the second, perhaps, the quelling sources had not yet run dry. But with the

increase of the body of knowledge and the infinitely ramifying extension of its details, the necessity of keeping handbooks and treatises up to date, all of which led to reproductions of reproductions in untold measure, humanity got farther and farther away from its original inspiration in certain departments—much to the detriment of critical inquiry, but more so to that of instruction. Thus, even in the first decade of this century we find an eminent mathematician complaining that Newton, the Bernoullis, and even Euler were not read, and ascribing certain grave aberrations in his science to their neglect. Thomson & Tait's effort to re-establish the hegemony of Newton's dynamical ideas is known to all.

The reaction first and naturally set in in connexion with the historical sciences, philosophy, Biblical research, literature, etc., and although it was long before its quickening effect was felt in science, the vigor with which it is now taking possession of this field, has made amends for its tardiness. Its visible expression is the vast number of recent books by scientists on the theory of knowledge, histories of special sciences and groups of sciences, the humanistic and organic character which instruction is taking on, and lastly but most important of all, and having an intimate connexion with the foregoing, the publication of series of Scientific Classics, from which students may draw their inspiration undefiled. The best known of these are the series of Dr. Ostwald, published by W. Engelmann of Leipsic, and the fac-simile reprints of epoch-making works issued by Mayer & Müller of Berlin. We may have occasion to mention these in detail later.

The most recent testimony of the power, beauty, and utility of the new idea, as a means of quickening instruction, is the book by Dr. Dannemann now under notice. Dr. Dannemann's work is designed to be an elementary history of the natural sciences, wherein the accounts of the great monumental discoveries of science shall be given in the original words of their first promulgators. The powerful stimulus which such a book offers cannot be overrated. It is intended primarily for students in high schools, polytechnical schools, colleges, etc., but is so delightful and unique in character, and supplies so gaping a want in the literature of instruction and of autodidactic reading that there is no lover of scientific culture, nor even of genuine classical culture, but could wish its pages might be ardently dwelt upon and absorbed by every man and woman. It is no exaggeration to place upon it a religious valuation. The day is not many centuries distant when such a book, compiled perhaps on slightly different lines, will take its place in our home-libraries by the side of *The Imitation* or the *Mahāparinibbāna Sutta*.

The idea of using for purposes of instruction classical researches of the great masters of science is not a new one, having been proposed a long time ago by Professor Mach of Vienna as being psychologically and æsthetically far better qualified for imparting the genius of science than the systematic but dry study of skeleton compendiums. Professor Mach's plan aimed at positive, typical instruction in science for students not intending to pursue a professional scientific career, and would have embraced only a few but relatively complete researches. Dr. Dannemann's

idea is slightly different. His selections comprehend nearly *all* departments of inquiry and constitute, so to speak, an anthology of science. The book may be compared to the *Quellenkunde* of historical students, although it is both more and less than a book of sources in giving specimen passages and in not giving full bibliographies.¹ We can convey no more vivid idea of the beautiful and useful character of the work, nor bestow upon it higher praise than by enumerating a list of the passages reproduced, each of which is preceded by a brief biography and characterisation of its author.

There are 62 in all. The first four are from the *Zoölogy* of Aristotle, from the mechanical and mathematical works of Archimedes, and from Pliny's *résumé* of the scientific knowledge of antiquity. The fifth is from Copernicus, enunciating the heliocentric system. The sixth, seventh, and eighth are from Galileo: (1) on the Copernican doctrine, (2) on falling bodies, and (3) on the discovery of the moons of Jupiter and the rings of Saturn. The ninth is Gilbert on the magnet, the tenth Kepler on comets. The eleventh is on Bacon as the promulgator of the inductive method of inquiry.

Next come Pascal and Périer on barometer-heights, Guericke on the air-pump, Newton on sunlight and the law of gravitation, Huyghens on the undulatory character of light, Mariotte on the atmosphere, Swammerdam on bees, Hales on the physiology of plants, Celsius on the thermometer, Kant and Laplace on the origin of the universe, Chladni on meteors, Euler on the undulatory theory, Aepinus on electricity, and Franklin on the lightning-rod. Scheele's discovery of nitrogen, Lavoisier and Laplace on combustion and on heat, Galvani on electricity, and selections from Goethe's *Metamorphosis of Plants*, follow. Then we have Sprengel on the fertilisation of flowers, Saussure's chemical researches on vegetation, Blumenbach on anthropology, Cuvier's enunciation of his "natural system," Dalton's atomic hypothesis, Berzelius on the fixed proportions of atoms, Gay-Lussac on the law of volumes, and on iodine, Davy on potassium and sodium, Cuvier on catastrophes, Lyell on geology, Wöhler on aluminium, and Oersted on the magnetic needle as affected by the electric current. Afterwards come extracts from Faraday's *Experimental Researches*, Talbot's invention of photography, Johannes Müller on the sense of sight, Schwann on the cells of organisms, and Schleiden's refutation of the assumption of vital force. The last are Liebig on vegetable nutrition, Unger on the transition from the vegetable to the animal world, Darwin on the formation of coral islands, Bessel's first measurement of the distance of a fixed star, Carnot on the theory of the steam engine, Mayer on the conservation of energy, Schönbein on ozone, Schrötter on red phosphorus, Pasteur on micro-organisms, Kirchhoff and Bunsen on spectrum analysis, and, lastly, Alexander von Humboldt's *résumé* of the state of natural knowledge in the year 1845.

¹ A second volume is promised, portraying the connexions of the sciences whose results are here exhibited.

From this list no one can withhold his admiration. Additional selections might be suggested, but none could well be omitted.

In commending the book of Dr. Dannemann, we could do the student no greater service than to recommend for his collateral perusal Carus Sterne's *Allgemeine Weltanschauung in ihrer historischen Entwicklung* (Stuttgart: Otto Weisert), which depicts in rapid and brilliant strokes the connected development of that body of knowledge of which Dr. Dannemann offers the living documents.

T. J. McCORMACK

DIE GRASSMANN'SCHE AUSDEHNUNGSLEHRE. Ein Beitrag zur Geschichte der Mathematik in den letzten fünfzig Jahren. Von Dr. V. Schlegel, Professor an der Gewerbeschule in Hagen. Leipsic: B. G. Teubner. 1896. Pages, 44.

Grassmann's ideas have been widely studied in America, and much non-professional curiosity has been aroused with regard to them. The present contribution by Dr. V. Schlegel to the history of the great work embodying them will therefore be a welcome help to all who desire a closer knowledge of the externalities of the subject,—to mathematicians as a bibliographical survey, and to laymen as characterising the significance of the movement. Dr. Schlegel was a teacher at Stettin and a younger colleague of Grassmann during the latter years of the great mathematician's life, and has since devoted most of the time which he could spare from his professional labors to the enthusiastic research of Grassmann's achievements. The present brochure, which has been wisely printed in separate form, so as to be accessible to students, is a brief and accurate history of the *Ausdehnungslehre* and of its broadly ramified relationships with other branches of mathematics. The useful bibliography which is appended contains more than one hundred and eighty titles, while that indispensable adjunct, an index of names, is not missing. μ .

INTRODUCTION TO SOCIOLOGY. By Arthur Fairbanks. New York: Imported by Charles Scribner's Sons. 1896. Pages, xv, 274. Price, \$2.00.

THE PRINCIPLES OF SOCIOLOGY. An Analysis of the Phenomena of Association and of Social Organisation. By Franklin Henry Giddings, M. A. Professor of Sociology in Columbia University in the City of New York. New York: Macmillan and Co. 1896. Pages, xvi, 476. Price, \$3.00.

There are so many minds now engaged in studying the laws which govern the problems presented by society, it is not surprising that these two works should appear about the same time, although that of Professor Giddings had a short precedence. Necessarily they go over much the same ground, and for this reason, as well as owing to certain contrasts they present, they may with propriety be reviewed together. It is true that Professor Fairbanks does not claim to have given even a systematic outline of the principles of Sociology. He admits, moreover, his obligations to Professor Giddings's earlier writings, although the *Principles of Sociology* reached him only after his own work was in type. But it is for others to judge of